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CORONAVIRUS SHUTDOWN'S IMPACT: DRIVEN FARMERS TOWARDS CA PRACTICES

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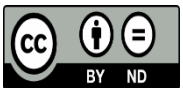
ABSTRACT

In December of 2019, Wuhan, China, was hit by a new coronavirus infection (COVID-19) caused by SARS-CoV-2. The World Health Organisation (WHO) proclaimed this disease a pandemic on March 11, 2020, and a few days later, the Government of India ordered a total lockdown of the nation as a response to the scarcity of migrant workers caused by the sickness. The purpose of this research was to find out if, during the period of manpower scarcity that occurred during the COVID-19 Shutdown, farmers were more inclined to employ the conservation agriculture (CA) practices like Direct Seeded Rice (DSR) than the alternative, Transplanted Puddled Rice (TPR/Transplanting technique). The Haryana areas of Ambala were the sites of studies on the epidemic and the challenges faced by farmers using it in 2020 and 2021. Twenty five farmers from four different villages were selected at random. To gather empirical data, the 100 respondents were interviewed according to a set timetable, and the results were analysed using standard procedures. Most farmers (77.50%) classified themselves as having a low to medium level of DSR adoption during the Kharif 2020 paddy season, while 22.50 percent classified themselves as having a high level of adoption. During the Kharif 2021 season, 87.50% of farmers were classified as having a Low to Medium level of DSR technology implementation, while 12.50% were classified as having a High level of adoption. In part due to labour limitations during the Shutdown in 2020, farmers appear to have implemented DSR at a little higher rate in 2020 than in 2021. To perform the TPR method of transplanting, farmers need additional helpers, and this migrant labour was easily available before the shutdown. The purpose of this scenario is to encourage the farmer to use a DSR drill or equipment during the quarantine period caused by the epidemic. Since farmers' requirements for it had increased as a result of the limited supply of migrant labour due to lockdowns, the shortage of equipment availability at the time of sowing was the main impediment. Weed infestation, a lack of competence in DSR agriculture, the occurrence of rain prior to germination, a lack of ambition to adapt, etc. were just some of the other, far more important challenges to the adoption of DSR technology by the farmers. At the 0.05 level of significance, the results also showed a positive correlation between DSR

technology adoption and characteristics like education, land ownership, access to farm equipment, media exposure, economic motivation, inventiveness, DSR technology training received, extension contact, and risk orientation. In light of these findings, the government should implement more intensive extension efforts to increase farmer awareness and ongoing strong promotional strategies, including better incentives for DSR farmers, in order to encourage the adoption of the recommended practises for DSR.



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1. INTRODUCTION

In December of 2019, Wuhan was hit by an outbreak of novel coronavirus disease, also known as COVID 19, which was caused by the SARS CoV2 virus and had symptoms similar to pneumonia. Within days of this disease becoming a global concern, the World Health Organisation (WHO) declared a pandemic on March 11, 2020. India imposed a statewide lockdown on March 24, 2020, because to the COVID-19 epidemic, which helped the rest of the world value migrant work. Many temporary employees left as the lockdown was lifted. The agricultural industry was harmed by the lack of workers. The global community gained a better appreciation for and understanding of migrant workers when the government of India placed a total lockdown on the country on March 24, 2020, in reaction to the disease. After the lockdown started, migrant employees couldn't go anywhere without permission, so many of them went back to their home countries. Farms all around the world suffered the effects of the agriculture industry's downturn as a result of a severe lack of available labour [19]. The inactivity of migrant agricultural labourers affects the labor-intensive rice growing process.

More over half the world's population relies on rice (Oryza sativa L.) as their main source of nutrition. Ninety percent of the world's rice is produced and grown in South Asian countries. More than 47 million hectares are devoted to rice cultivation in India, yielding 120 million metric tonnes (MT) of rice each year [4]. A 22% rise in crop consumption is predicted over the following decade, with 2033 consumption of 145 MT [3]. Depleting natural resources, a falling water table, growing labour and energy shortages, higher fuel prices, and shifting climatic conditions have all been linked to a plateau in rice yields and a decline in factor productivity, according to recent studies. Using less water, labour, land, and energy is necessary to minimise resource use and increase yields. Simply direct seeded rice (DSR), which is planted before or immediately after pre-monsoon rain, is a feasible choice in light of these issues since it conserves water, reduces labour costs, reduces greenhouse gas (GHG) emissions, and adapts to climate challenges. Several recent studies support this idea [18], [21]. Puddling, transplanting, and maintaining a wet field are the three main components of the rice cultivation transplanting procedure. In some cases, DSR may be preferable to the aforementioned three treatments [23], [6]. There are two primary varieties of direct sowing. (2) dry-DSR, which entails spreading or drilling dried crop seeds on unmoist soil after dry tillage or zero tillage. One method is called wet-DSR, and it entails planting sprouted rice seeds in rows or strewn across moist ground.

According to a 2022 study by Kumar et al., Punjab and Haryana are the top two contributors to India's national rice purchasing pool. In 18 of the state's administrative divisions, rice cultivation is the primary economic activity. The water used throughout the growth season and for land preparation by seven of these

crops puts a strain on the water supply and is considered high productivity. DSR is far more important than conventional paddy farming techniques since it requires less time and effort and helps preserve soil structure. The Haryana Department of Agriculture does not actively support the DSR, or modern rice farming methods, outside of a few of rice-growing regions. Survey study was conducted in this setting to learn more about farmers' experiences with and attitudes about DSR farming practises advised by CCSHAU, PAU, and other SAUs/Agrill study Institutes.

2. MATTERIALS AND METHODS

This inquiry was conducted in the state of Haryana during the 2020–2021 COVID-19 epidemic. Ambala, one of the districts of the state, was selected at random. The Ambala district's Barara and Saha blocks were chosen at random. And from each selected block, two villages were picked at random. Rajouli and Mullana from the Barara block, and Talheri Gujran and Chudiala from the Saha block in the district, so two villages of each block were randomly selected. Further, twenty-five farmers were chosen at random from each of the villages. One hundred farmers were chosen by multi-stage random selection. The most important information was acquired through in-person interviews organised using an efficient interview schedule. The empirical data were analysed by computing the frequency, percentage, mean, correlation, and regression using SPSS version 26. The farmers' responses to 17 items were collected using a three-continuum scale for adoption degree (totally adopted, partially adopted, and no adoption), with scores of 3, 2, and 1 assigned accordingly. The nine largest and most common obstacles to using DSR technology were spelt out for the aim of collecting feedback from farmers on a three-continuum scale. Scores of 3, 2, and 1 respectively indicate Very serious, Serious, and Not so significant limitations. A weighted mean score (WMS) and ranking were derived from these results.

3. RESULTS AND DISCUSSION

3.1 Personal traits of the farmers

Socio-personal factors of interviewees, such as age, level of education, exposure to the media, economic motivation, creativity, extension contact, risk orientation, etc., are likely to affect whether or not they use DSR technology (Table 1.1). As a result, these factors were taken into account in the research study, and it was found that more than half of the respondents (43.20%) were in the middle age group (43-57 years), while 42.00% were in the younger age group (up to 42 years), and 64.40% of farmers owned small to medium-sized farms (1-10 acres). When it came to education, more than 90% (90.70%) of the people who answered the survey had finished an upper-middle or middle-level school education. More than 80% of farmers (82.50%) had access to tractors (either because they bought them or rented them), and 63.7% of farmers were in the "medium" group when it came to having farm tools. More than half of the people who answered the survey (53.60%) had a middle level of exposure to mass media. This was followed by a high level (25.10%) and a low level (21.30%). Nearly half of the farmers (47.50%) said they had low levels of extension contacts, while 33.8 and 18.7 percent of the farmers said they had high levels of extension contacts. Eighty percent of farmers said that their drive to make money was between average and high. Eighty percent of farmers didn't get any training on CA practises. In terms of risk orientation, 42.0% of respondents had a medium risk orientation, 33.80% had a high risk orientation, and 24.2% had a low risk orientation. Also, 41.30% of respondents said they had a medium level of creativity. [8] came to similar conclusions. They found that almost half of the DSR farmers were in the middle age group of 43–57 years, had finished their secondary schooling, and worked on 10–25 acres of land. Also, [9] came to the same conclusions about the traits of the study's respondents.

Table 1.1 personal traits of farmers

(n=100)

Sl. No.	Variables	Category	Frequency	Percentage
1.	Age	Young (up to 42)	67	42.0
		Middle (43-57)	69	43.2
		Old (above 57)	24	15.2
2.	Education	Illiterate(0)	5	3.1
		Primary (1)	10	6.3
		Middle(2)	33	20.6
		Metric(3)	50	31.3
		Higher Secondary (4)	34	21.3
		Graduate and above (5)	28	17.5
3.	Land holding	Less than one acre (1)	1	0.6
		Up to 5 acres (2)	50	31.3
		6 to 10 acres (3)	52	32.5
		11 to 15 acres (4)	18	11.3
		16 to 20 acres (5)	20	12.5
		More than 20 acres (6)	19	11.9
4.	Farm power	No draft animal (0)	3	1.9
		1-2 draft animal (1)	11	6.9
		3-4 draft animal (2)	6	3.8
		One or more prestige animal (3)	4	2.5
		Tractor (5)	115	71.8
		Tractor and 1-2draft animal (6)	17	10.7
		Tractor and 3-4draft animal (7)	3	1.9
		Tractor and 1or more prestigious animal (8)	1	0.6
5.	Availability of Farm Equipment	Low (up to 8)	17	10.6
		Medium (9-12)	102	63.7
		High (above 12)	41	25.7
6.	Mass Media Exposure	Low (up to 12)	34	21.3
		Medium (13-24)	86	53.6
		High (above 24)	40	25.1
7.	Farming System	Livestock	146	91.2
		Poultry	2	1.2
		Fisheries	0	0.0
		Agro-forestry	17	10.6
		Mushroom cultivation	0	0.0
		Bee keeping	0	0.0
		Organic farming	10	6.0
		Floriculture	0	0.0
		Poly house nursery	0	0.0
		Poly house vegetable production	2	1.2
8.	Extension Contact	Low (up to 5)	54	33.8
		Medium (6-9)	76	47.5
		High (above 9)	30	18.7
9.	Economic Motivation	Low (up to 12)	32	20.0
		Medium (13-15)	68	42.5
		High (above 15)	60	37.5
10.	Training received (selected RCT)	No training received (0)	130	81.3
		One training (1)	21	13.1
		Two training (2)	6	3.8
		Three and above three training (3)	3	1.9
11.	Risk orientation	Low (11-14)	39	24.2
		Medium (15-17)	67	42.0
		High (18-21)	54	33.8
12.	Innovativeness	Low (up to 14)	42	26.2
		Medium (15-18)	66	41.3
		High (above 18)	52	32.5

3.2 Adoption extent of the DSR cultivation practices

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According to the data in Fig. 2.1, farmers' agricultural practises in 2020 received a weighted average score and ranked in the following order: The sowing technique received the highest score, a weighted mean score (WMS) of 2.12, followed by field preparation and laser levelling. made sure the soil was suitable for planting rice directly, compensated for seed depth, When is a good time to prepare the pitch? When it's wet or covered in tar? When using a DSR with an inclined plate mechanism and a press wheel connected machine? When treating the seeds? With the proper fertiliser, watering in line with recommendations, the required spray nozzle, the right type, spending time and A few days before maturity, irrigation was stopped for plants with WMS of 2.10, 2.06, 2.02, 1.96, 1.92, 1.80, 1.81, 1.80, 1.75, 1.73, 1.71, 1.68, 1.66, 1.63, 1.50, and 1.47, respectively, graded II, III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII, XIV, XV, and XVII.

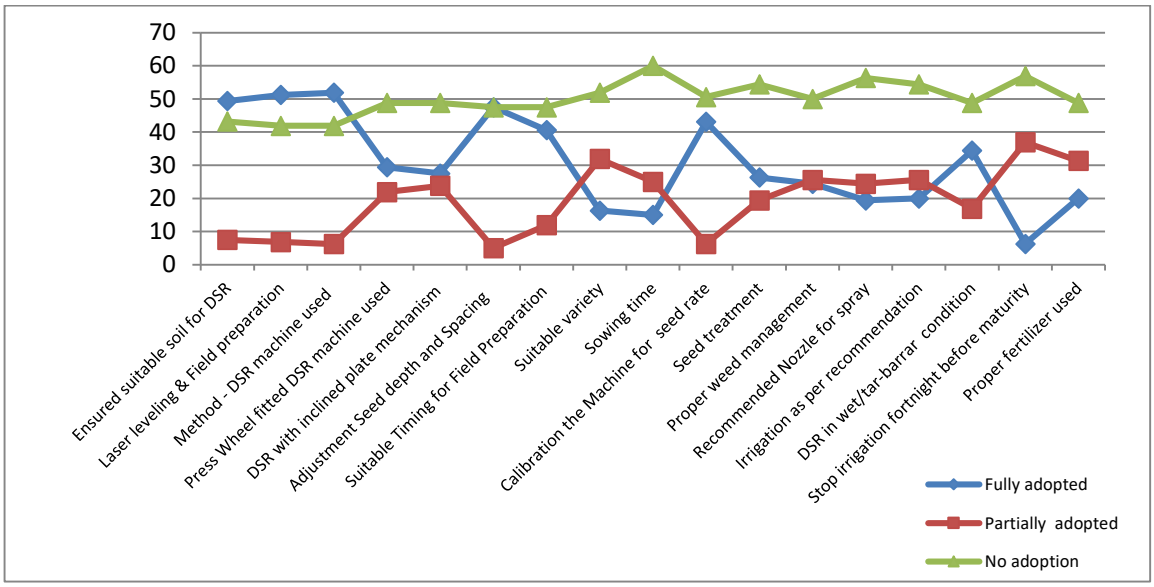

Figure 2.1 shows the proportion of recommended farming methods adopted by the farmers in 2020 under DSR cultivation.

While the practises that the respondents continued to utilise in Kharif 2021 are depicted in Fig. 2.2, the Covid-19 pandemic was found to have marginally decreased the WMS for those practises compared to that of 2020. Therefore, the method of sowing was rated top with the highest weighted mean score (WMS) of 2.08, followed by laser levelling and field preparation, which was ranked second with WMS 2.06, and making sure the soil is appropriate for direct-sown rice, which was placed third with WMS 2.03. Both tables show that various practises are being implemented to a sufficient degree of full adoption in accordance with the CCS HAU, Hisar, PAU, Ludhiana recommendations. The bulk of practises, including seed preparation, proper fertiliser application, suggested spray nozzle use, sowing time, etc., are only partially put into practise. As a result, it is crucial to support and encourage farmers by setting up regular training programmes, lectures, campaigns, and demonstrations. Similar conclusions were reached by [10], who suggested that more study was required to ascertain the advantages of ploughing, levelling, seed germination, sowing, regulating water and managing weeds when directly planting rice with a drum seeder in a puddle field.

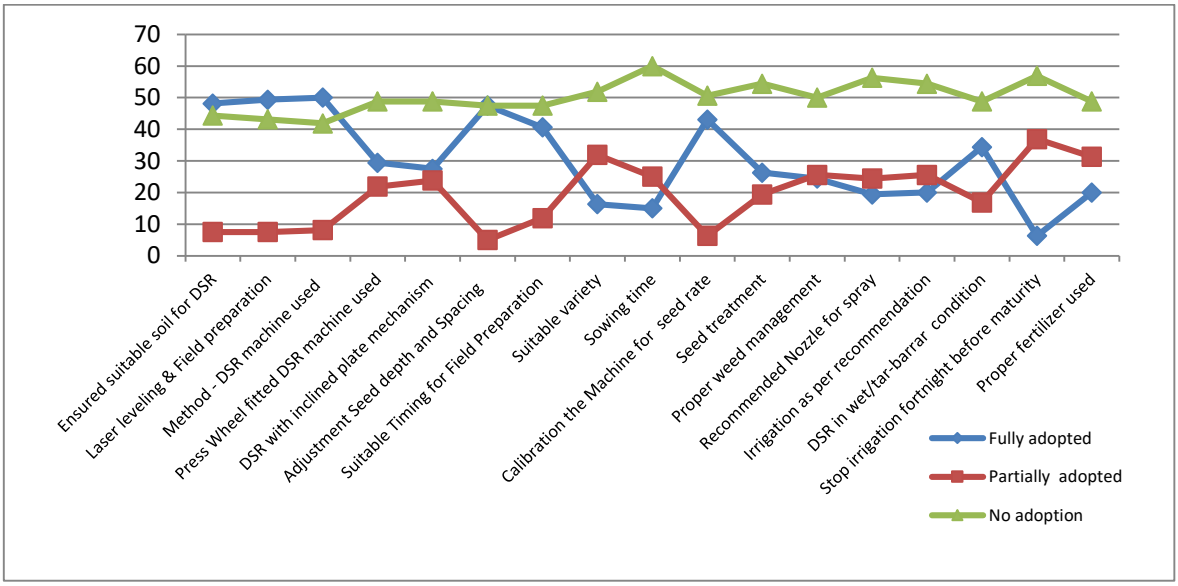

Figure 2.1 shows the proportion of recommended farming methods adopted by the farmers in 2021 under DSR cultivation.

3.3 Overall adoption extent of DSR cultivation technology practices

Less than half of the farmers (46.86%) fell into the low level adoption group, followed by medium (30.63%) and high level (22.51%) of adoption. Further analysis of the data indicates that, for the year 2020, the majority of respondents (77.50%) maintained a low to medium degree of general adoption of DSR technology among farmers.

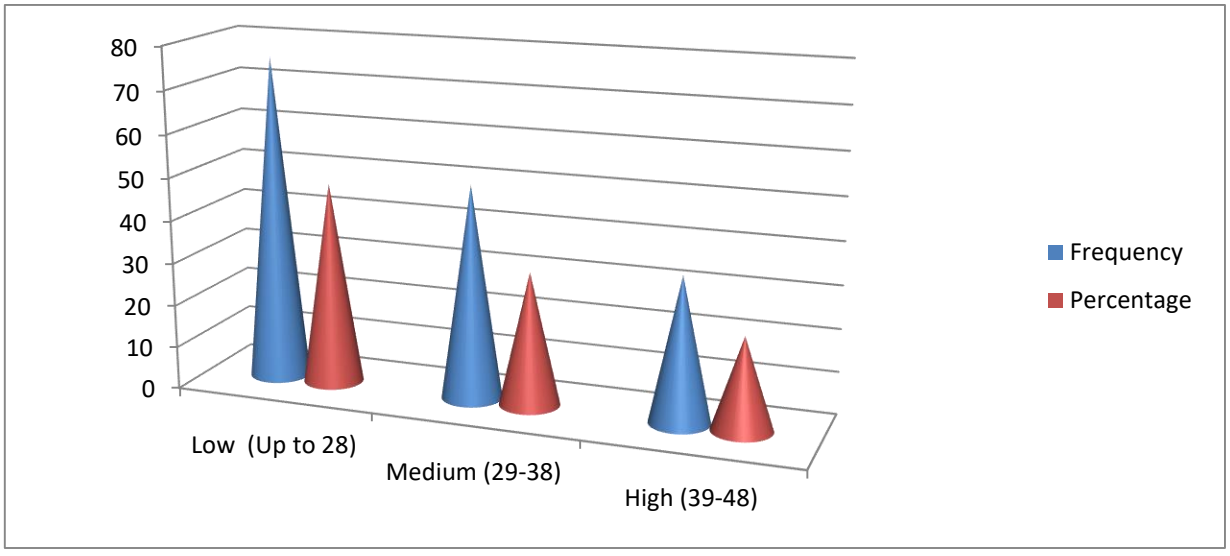

Fig. 3.1. Depicts Over all Adoption of DSR technology practices followed in 2020 by farmers

However, Fig. 3.2 shows that for the year 2021, more than half of the respondents (63.77%) belonged to the low level of adoption group, followed by the medium (23.72%) and the high level (12.51%) of adoption groups. The majority of responders (87.52%), according to further data analysis, utilised DSR technology on a low to medium level. It is clear that in 2020 there were more farmers who fell into the high group than in 2021. It appears that not all of the SAUs' suggestions have been implemented by farmers. It can be as a result of poor marketing strategies, a lack of incentives that are appropriate for farmers, a lack of knowledge about DSR technology, or strong linkages between farmers and the previous method of rice cultivation. As

a result, the government must provide incentives to farmers and educate them about DSR technology through reputable mass media, such as farm magazines and literature, as well as DSR-related radio and TV programmes, which are crucial for completing and complementing their knowledge and for reaching the greatest number of farmers possible in order for the technology to be quickly adopted by the farming community [11].

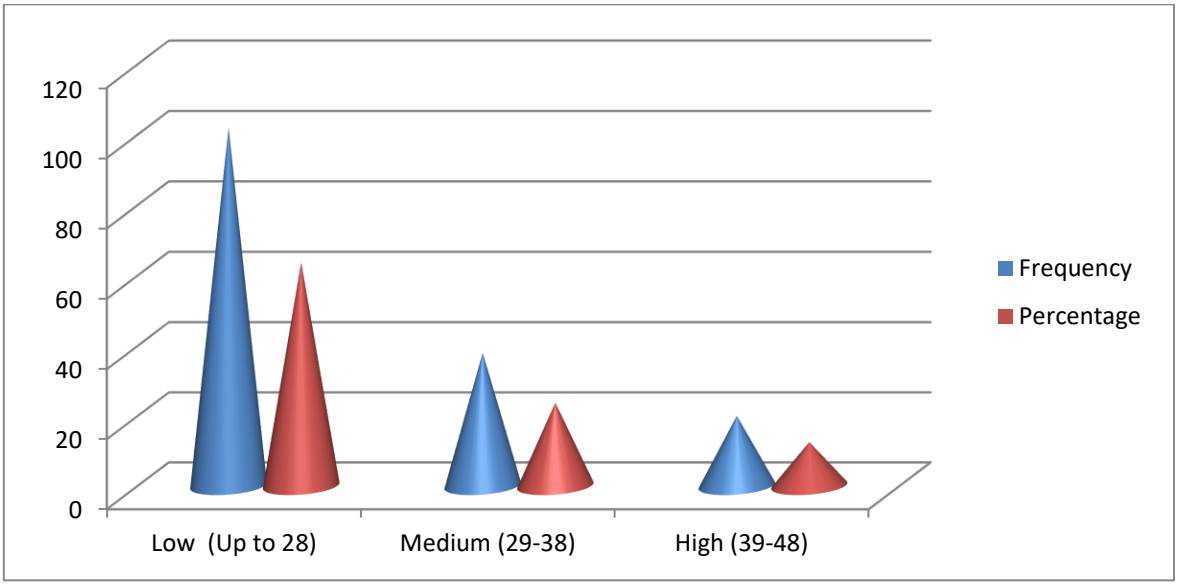

Fig. 3.2. Depicts Over all Adoption of DSR technology practices followed in 2021 by the farmers

3.4 Obstacles faced in adoption of DSR cultivation technology

The challenges/issues farmers may encounter in 2020 when they use the DSR growing method are shown in Fig. 4.1. Infestation of weeds, occurrence of rain before germination, inappropriate moisture at sowing, depth of seed, gap filling, inadequate knowledge of DSR cultivation, iron deficiency, and unwillingness to change were ranked second through seventh, with weighted mean scores (WMS) of 2.43, 2.35, 2.31, 2.18, 2.17, 1.94, 1.90, and 1.84, respectively.

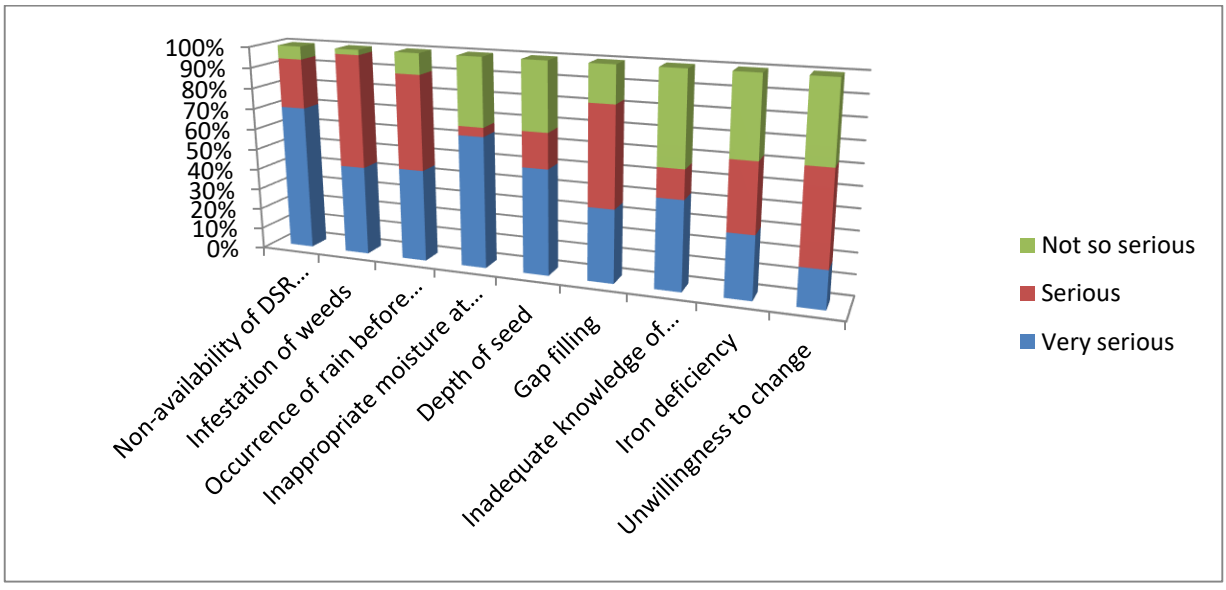

Fig. 4.1. Showing the degree of seriousness of obstacles in rank wise order and in percentage as perceived by the Respondents in 2020

While the respondents' challenges in 2021 are shown in Fig. 4.2, which shows that weed infestation came in first with the highest weighted mean score (WMS) of 2.88, followed by inadequate knowledge of DSR cultivation, the occurrence of rain before germination, resistance to change, the lack of a DSR machine at the time of sowing, iron deficiency, gap filling, inappropriate moisture at sowing, and depth of seed, which came in second, third, fourth, fifth, sixth.

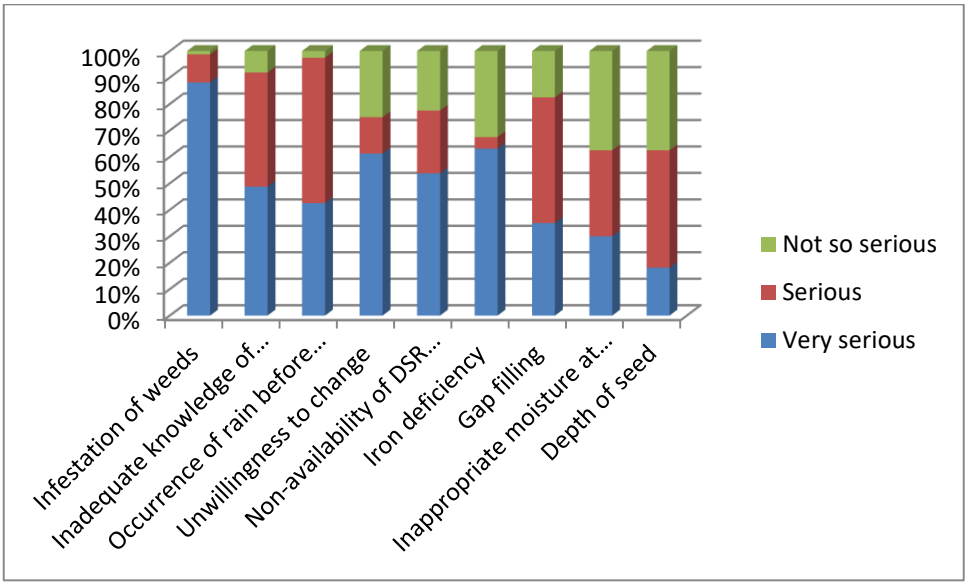

Fig. 4.2. Showing the degree of seriousness of obstacles in rank wise order and in percentage as perceived by the Respondents in 2021

Farmers were obliged to employ DSR drills rather of the labor-intensive traditional method of PTR because to the COVID-19 Pandemic's lockdown and the highly restricted or nonexistent supply of migrant labour. The demand for DSR machines instantly surged as a result, and as can be seen in Figs. 4.1 and 4.3, the farmers' most common problem was a lack of DSR drills. The government should plan adequate education campaigns, practical instruction in using the DSR effectively, timely methods, and field demonstrations for farmers. The government should also give individual farmers, cooperatives/CHC, and adequate incentives the DSR machine with additional subsidies and ease. Similar to this, [12] found that the primary challenge for the majority of farmers was their lack of understanding of DSR agriculture. As a result, the government must establish a thorough skill-development training programme on all phases, methods, and packages of DSR practises in order to employ the technology [13].

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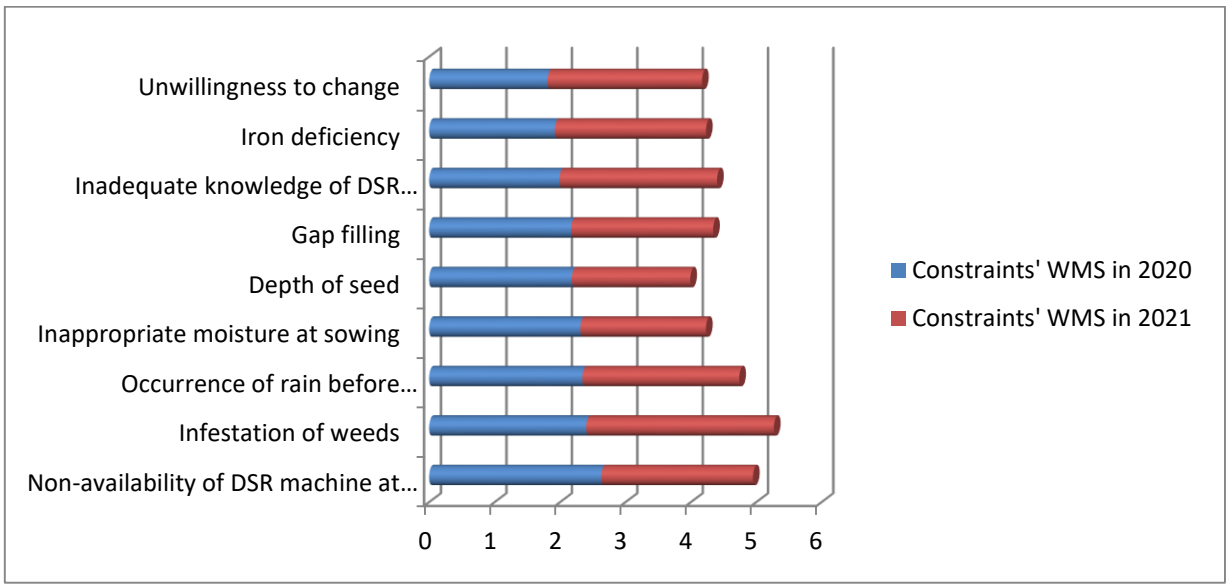

Fig. 4.3. Depicting Weighted Mean score of Constraints perceived by Farmers during 2020 & 2021 in adopting the DSR Technology

3.5 Correlation and association between farmer's personal attributes with their adoption level of DSR cultivation technology

In contrast to age, farm power, and farm size, the Graphical Chart, Fig. 5, clearly shows that the 'correlation coefficient' between farmer personality traits, such as education, land ownership, the availability of farm equipment, mass media exposure, economic motivation, innovativeness, training received on DSR technology, extension contact, and risk orientation, showed positive and significant correlation with their adoption level of DSR technology. However, in the case of the "regression coefficient," it was found that education, the availability of agricultural equipment, media exposure, economic incentive, creativity, and extension contact were pertinent. However, the degree of DSR technology adoption was not substantially influenced by age, land ownership, farm power, farming technique, training, or risk aversion. [14] noted comparable results. Additionally, these results have received some support from the studies of [15], [5]. It was also discovered that the investigation's independent factors, which had been picked jointly, produced a variation of 62.00% in the adoption level of DSR technology while other variables were held constant. This implies that only 62.00 percent ($r2 = 0.62$) of the variance in adoption was explained by these variables, with the remaining 38.00 percent due to unrelated variables that were not taken into account in the study.

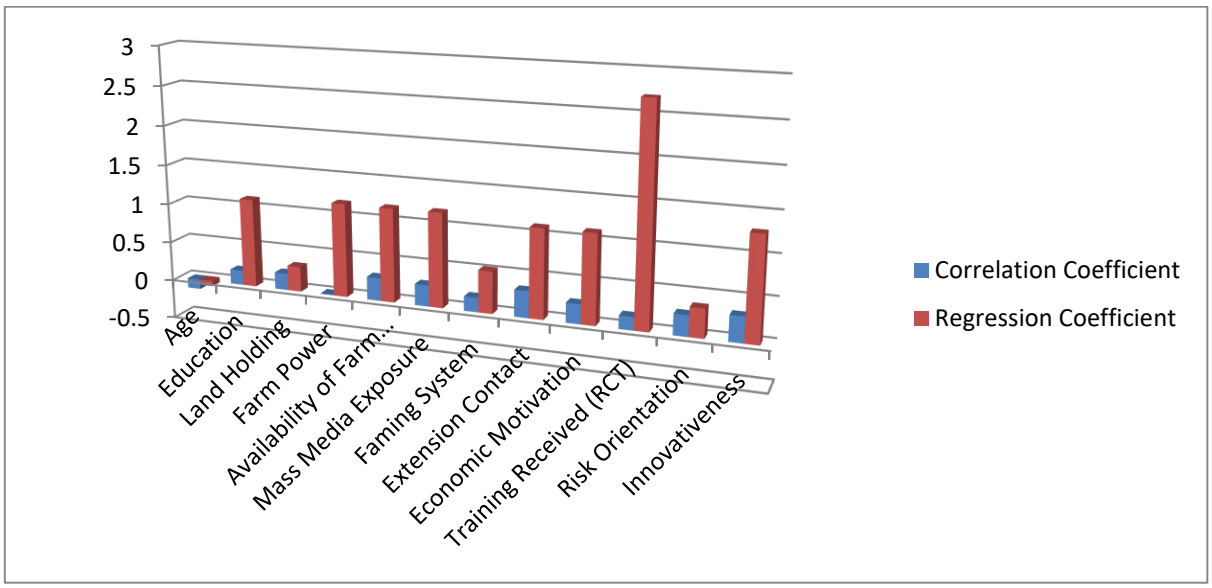

Fig. 5. Correlation and association between farmer's personal attributes with their adoption level of DSR cultivation technology

4. CONCLUSION

Farmers were forced to change their traditional farming practices towards conservation agriculture practices for the cultivation of rice through the Direct Seeded Rice method, a labour- and resource-saving technology that also saves time, money, and natural resources, due to the extremely limited or nonexistent availability of migrant labour during the COVID-19 Pandemic Shutdown. The lack of migrant workforce that followed the Shutdown brought on by the Covid-19 pandemic, it can be concluded, contributed positively to the adoption rate of DSR by forcing farmers to abandon the antiquated TPR (Transplanted Puddled Rice) technology in favour of the more modern DSR technology. Due of the shortage of migrant workers during the shutdown, they have embraced DSR practises. Additionally, this situation had raised demand for DSR drills among farmers because to the limited number of machines that were available during the Shutdown. The study's conclusions indicate that since the demand for DSR drill increased immediately, farmers began to experience a severe scarcity of DSR drills in 2020. The government should plan adequate awareness campaigns, technical hands-on DSR drill operations, DSR crop management trainings, and farmers' access to essential and timely technique and field demonstrations. Additionally, the government could use cooperatives and Custom Hiring Centres to more quickly and affordably deliver CA related equipments like DSR machines to individual farmers.

5. REFERENCES

[1] https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

[2] Agarwal, K.M., Mohapatra, S., Sharma, P., Sharma, S., Bhatia, D., Mishra, A., (2020) Study and overview of the novel corona virus disease (COVID-19). Sensors International.Volume 1, 2020, 100037 (https://doi.org/10.1016/j.sintl.2020.100037)

[3] Anonymous (2020). Annual report 2019-20. Ministry of Planning. Government of India, Delhi.

[4] Anonymous (2021) Economic Survey of India (2020-21). Ministry of Finance, Government of India, Delhi.

[5] Ehsanullah, N. Akbar, K. Jabran and T. Habib. (2007). Comparison of different planting methods foroptimization of plant population of rice (Oryza sativa L.) in Punjab (Pakistan). Pakistan Journal of Agricultural Sciences, 44, 597-599.

[6] Kamboj, R., Singh, D. and Kaur, L. (2022). Adoption Status of Direct Seeded Rice Technology by the Farmers of Punjab. Indian Journal of Extension Education, 58 (1), 76-80.

[7] Kaur, M., Mahal, A. K. and Sekhon, M.K. (2011). Adoption of labour saving technology in paddy transplantation-micro level evidences from Punjab. Agricultural Economics Review, 24, 568-580.

[8] Kumar R (2022). A Study on Agricultural Resource Conservation Technologies in Haryana. Ph. D. Thesis. Chaudhary Charan Singh Haryana Agricultural University, Hisar.

[9] Kumar R, GodaraAK,SainiN,BishnoiD K, Malik, A.K.and Kumar N (2022). Adoption Extent of Farmers about Zero Tillage Seed Drill Technology in Haryana. The Pharma innovation J 11(3): 294-296.

[10] Kumar, R., Singh, V.D., Kumar, A., Prem, G., Singh, R.K., Kumar, Y. (2022). Farmers' Extent of Knowledge toward Happy Seeder Technology. Agricultural Mechanization in Asia Africa and Latin America. Volume 53, Issue 11, November, 10421- 10427.

[11] Kumar, R., Singh, V.D., Kumar, A., Singh, R.K., Kumar, Y., Kumar, D., Malik, A.K., Kumar, R. (2022). Direct Seeded Rice cultivation technology- Acceptance Status in Haryana state of India. Agricultural Mechanization in Asia, Africa and Latin America. Volume 53, Issue 11, November, 10273-10280,

[12] Kumar, R., Singh, V.D., Singh, R.K., Kumar, D. (2022). Preference Direct Seeding Over Transplanting Technology in Rice during Lockdown Period in Haryana. Agricultural Mechanization in Asia, Africa and Latin America. Volume 53, Issue 10, 10199- 10208.

[13] Kumar R, GodaraAK,KumarN,BishnoiD K, Arun P D, and Kumari N (2022). Knowledge Level of Farmers about Direct Seeded Rice Cultivation Technology in Haryana. The Pharma innovation J 11(2): 432-434.

[14] Kumar R, GodaraAK, Prem G, KumarN,BishnoiD K, MalikAKand SainiN (2022). Awareness Level of Farmers Towards Direct Seeded Rice Technology in Haryana State of India. Agricultural Mechanization in Asia, Africa and Latin America, 53(3): 6523-6528.

[15] Kumar, R. Batra, S. C. and Kumar, M. (2018). Use pattern of direct seeded rice (DSR) technology in paddy. International Journal of Pure & Appield Bio-Sciences, 6 (6), 562-578.

[16] Mahajan, G., Sharma, R., Kaur, R., Chauhan, B.S. (2015). Comparison of photoperiod-sensitive and photoperiod-insensitive basmati cultivars for grain yield, water productivity and quality traits under varied transplanting dates in Northwest India. Crop Pasture Science, 66(1), 793–801.

[17] Monikha, C. R., Balasubramaniam, M., & Sukumar, J. (2021). Effectiveness of extension tools among the Paddy Farmers of Tenkasi district of Tamil Nadu. Indian Journal of Extension Education, 57(1), 110-113.

[18] Rakesh, S., Mahajan, G., Mukesh, S., Angrej, S., Chauhan, B.S. (2017). Performance of drip-irrigated dry-seeded rice (Oryza sativa L.) in South Asia. Paddy Water Environment, 15, 93–100.

[19] Ramkumar, R.(2020) Agriculture and the Covid-19 Pandemic: An Analysis with special reference to India. Review of Agrarian Studies 10 (2369-2020-1856)

[20] Rohila, A.K., Ghanghas, B.S., Kumar, A. and Sehrawat, P.S. (2018). Constraints Perceived by Farmers in Adoption of Direct Seeded Rice Cultivation in Haryana. Indian Journal of Extension Education, 54 (2), 168-175.

[21] Sebastian, J., Janvier, A., Frederick, A., Siddiqui, A., & Singh, V. (2017). Propagation of direct seeded rice-a case of Muktsar city. Contemporary Research India, 7(1), 97.

[22] Singh, R., Hansra, B.S. and Chand, R. (2013). Knowledge and Adoption level of Farmers of Haryana about Scientific Rice Cultivation Practices. Journal of Community Mobilization and Sustainable Development, 8(1), 24-28.

[23] Visalakshi, M. and Sireesha, A. (2016). Adoption status of direct seeding rice using drum seeder. Journal of Rice Research, 9(1), 30-34.